

CLAIMS

1. A radio communication system that is provided with a transmitting part radio communication apparatus and a receiving
part radio communication apparatus, in which an insertion
interval of a known reference signal inserted into a data
transmitted through a propagation path to said receiving part
radio communication apparatus from said transmitting part radio
communication apparatus is variable,

wherein said transmitting part radio communication
apparatus has known reference signal insertion interval
determining means that can determine the insertion interval of
said known reference signal, and

said transmitting part radio communication apparatus
inserts said known reference signal into said data, in
accordance with the insertion interval of said known reference
signal determined by said known reference signal insertion
interval determining means.

2. A radio communication system that is provided with a
transmitting part radio communication apparatus and a receiving
part radio communication apparatus, in which an insertion
interval of a known reference signal inserted into a data
transmitted through a propagation path to said receiving part
radio communication apparatus from said transmitting part radio

communication apparatus is variable,

wherein said transmitting part radio communication apparatus has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal; and reporting means for reporting a fact that the insertion interval of said known reference signal can be determined, together with a transmission request information of said data, to said receiving part radio communication apparatus prior to transmitting said data, and

10 said transmitting part radio communication apparatus, when receiving a reception preparation completion information that is a response to said transmission request information from said receiving part radio communication apparatus, determines the insertion interval of said known reference signal and
15 transmits said data, into which said known reference signal is inserted in accordance with the insertion interval of determined said known reference signal, to said receiving part radio communication apparatus.

20 3. The radio communication system according to claim 2, wherein said transmitting part radio communication apparatus refers to an information signal related to said reception preparation completion information received from said receiving part radio communication apparatus, and determines the insertion
25 interval of said known reference signal which is optimal in said

data transmission.

4. A radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication apparatus is variable,

10 wherein said transmitting part radio communication apparatus has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal, and

when said transmitting part radio communication apparatus transmits a data different from said data to said receiving part radio communication apparatus prior to transmitting said data and receives a reception Ack information indicating that the reception of said different data from said receiving part radio communication apparatus has been completed, 15 said transmitting part radio communication apparatus determines the insertion interval of said known reference signal and transmits said data, into which said known reference signal is inserted in accordance with the insertion interval of determined said known reference signal, to said receiving part radio 20 communication apparatus.

5. The radio communication system according to claim 4,
wherein said transmitting part radio communication apparatus
refers to an information signal related to said reception Ack
5 information received from said receiving part radio
communication apparatus, and determines the insertion interval
of said known reference signal which is optimal in transmitting
said data to said receiving part radio communication apparatus.

10 6. A radio communication system that is provided with a
transmitting part radio communication apparatus and a receiving
part radio communication apparatus, in which an insertion
interval of a known reference signal inserted into a data
transmitted through a propagation path to said receiving part
15 radio communication apparatus from said transmitting part radio
communication apparatus is variable,

wherein said transmitting part radio communication
apparatus has: known reference signal insertion interval
determining means that can determine the insertion interval of
20 said known reference signal, and

said transmitting part radio communication apparatus
receives an information signal transmitted to any radio
communication apparatus from said receiving part radio
communication apparatus, refers to said received information
25 signal and determines the insertion interval of said known

reference signal which is optimal in transmitting said data to said receiving part radio communication apparatus.

7. A radio communication system that is provided with a
5 transmitting part radio communication apparatus and a receiving
part radio communication apparatus, in which an insertion
interval of a known reference signal inserted into a data
transmitted through a propagation path to said receiving part
radio communication apparatus from said transmitting part radio
10 communication apparatus is variable,
 wherein said receiving part radio communication
apparatus has: known reference signal insertion interval
determining means that can determine the insertion interval of
said known reference signal; and reporting means for reporting
15 the insertion interval of said known reference signal determined
by said known reference signal insertion interval determining
means, to said transmitting part radio communication apparatus.

8. A radio communication system that is provided with a
20 transmitting part radio communication apparatus and a receiving
part radio communication apparatus, in which an insertion
interval of a known reference signal inserted into a data
transmitted through a propagation path to said receiving part
radio communication apparatus from said transmitting part radio
25 communication apparatus is variable,

wherein said transmitting part radio communication apparatus has transmitting means for transmitting an information for requesting the insertion interval of said known reference signal together with a transmission request information of said data, to said receiving part radio communication apparatus prior to transmitting said data,

said receiving part radio communication apparatus has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal; and reporting means for reporting the insertion interval of said known reference signal determined by said known reference signal insertion interval determining means to said transmitting part radio communication apparatus, prior to transmitting said data, and

said transmitting part radio communication apparatus transmits the information for requesting the insertion interval of said known reference signal together with the transmission request information of said data, to said receiving part radio communication apparatus prior to transmitting said data, and said receiving part radio communication apparatus determines the insertion interval of said known reference signal and reports the insertion interval of determined said known reference signal to said transmitting part radio communication apparatus, and said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with

the insertion interval of said known reference signal reported from said receiving part radio communication apparatus, and transmits to said receiving part radio communication apparatus.

5 9. The radio communication system according to claim 8, wherein said receiving part radio communication apparatus refers to the information signal related to the information for requesting the insertion interval of said known reference signal and the transmission request information of said data received
10 from said transmitting part radio communication apparatus, and determines the insertion interval of said known reference signal which is optimal in said data transmission.

10. A radio communication system that is provided with a
15 transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio
20 communication apparatus is variable,

 wherein said receiving part radio communication apparatus has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal, and

25 when said transmitting part radio communication

apparatus transmits a data different from said data to said receiving part radio communication apparatus prior to transmitting said data, said receiving part radio communication apparatus determines the insertion interval of said known reference signal and reports the insertion interval of determined said known reference signal to said transmitting part radio communication apparatus, and said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with the insertion interval of said known reference signal reported from said receiving part radio communication apparatus and transmits to said receiving part radio communication apparatus.

11. The radio communication system according to claim 10, wherein said receiving part radio communication apparatus refers to an information signal related to said different data received from said transmitting part radio communication apparatus, and determines the insertion interval of said known reference signal which is optimal in transmitting said data to said receiving part radio communication apparatus.

12. A radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data

transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication apparatus is variable,

wherein said receiving part radio communication apparatus has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal, and

said receiving part radio communication apparatus receives an information signal transmitted to any radio communication apparatus from said transmitting part radio communication apparatus, and refers to said received information signal and determines the insertion interval of said known reference signal, and reports the insertion interval of determined said known reference signal to said transmitting part radio communication apparatus, and said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with the insertion interval of said known reference signal reported from said receiving part radio communication apparatus, and transmits to said receiving part radio communication apparatus.

13. A radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data that

is propagated in a communication between said transmitting part radio communication apparatus and said receiving part radio communication apparatus is variable,

wherein said transmitting part radio communication apparatus and said receiving part radio communication apparatus have known reference signal insertion interval acquiring means that can acquire the insertion interval of said known reference signal, and

the insertion interval of said known reference signal acquired by said transmitting part radio communication apparatus and the insertion interval of said known reference signal acquired by said receiving part radio communication apparatus are used to determine the insertion interval of said known reference signal inserted into said data.

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14. A radio communication system that is provided with: a plurality of radio communication apparatuses; and a communication managing apparatus communicable with said plurality of radio communication apparatuses, in which an insertion interval of a known reference signal inserted into a data that is propagated in a communication between each of said plurality of radio communication apparatuses and said communication managing apparatus is variable,

wherein said communication managing apparatus has: known reference signal insertion interval determining means that

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can determine the insertion interval of said known reference signal which is optimal in the communication with each of said plurality of radio communication apparatuses; and storing means that can store the insertion interval of said known reference
5 signal which is optimal in a propagation path to each of said plurality of radio communication apparatuses.

15. A radio communication system that is provided with: a plurality of radio communication apparatuses; and a
10 communication managing apparatus communicable with said plurality of radio communication apparatuses, in which an insertion interval of a known reference signal inserted into a data that is propagated in a communication between each of said plurality of radio communication apparatuses and said
15 communication managing apparatus is variable,

wherein each of said plurality of radio communication apparatuses has: known reference signal insertion interval determining means that can determine the insertion interval of said known reference signal which is optimal in the
20 communication with said communication managing apparatus; and storing means that can store the insertion interval of said known reference signal which is optimal in a propagation path to said communication managing apparatus.

25 16. The radio communication system according to claim 15,

wherein each of said plurality of radio communication
apparatuses refers to a report signal which is reported to any
of said radio communication apparatuses by said communication
managing apparatus; and determines the insertion interval of
5 said known reference signal which becomes optimal in the
propagation path to said communication managing apparatus.

17. The radio communication system, according to one of the
preceding claims 1 to 16, wherein said known reference signal
10 insertion interval determining means refers to a temporal
variation quantity of a propagation path response, and
calculates the insertion interval of said known reference signal
which becomes optimal in transmitting said data.

15 18. A radio communication method used in a radio
communication system that is provided with a transmitting part
radio communication apparatus and a receiving part radio
communication apparatus, in which an insertion interval of a
known reference signal inserted into a data transmitted through
20 a propagation path to said receiving part radio communication
apparatus from said transmitting part radio communication
apparatus is variable, including:

a step where said transmitting part radio communication
apparatus determines the insertion interval of said known
25 reference signal; and

a step where said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with the insertion interval of determined said known reference signal, and transmits to said receiving part radio communication apparatus.

19. A radio communication method used in a radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication apparatus is variable, including:

15 a step where said transmitting part radio communication apparatus reports a fact that the insertion interval of said known reference signal together with a transmission request information of said data can be determined, to said receiving part radio communication apparatus prior to transmitting said data;

a step where said receiving part radio communication apparatus receives said transmission request information and transmits a reception preparation completion information that is a response to said transmission request information;

25 a step where said transmitting part radio communication

apparatus, when receiving said reception preparation completion information from said receiving part radio communication apparatus, determines the insertion interval of said known reference signal; and

5 a step where said transmitting part radio communication apparatus transmits said data, into which said known reference signal is inserted in accordance with the insertion interval of determined said known reference signal, to said receiving part radio communication apparatus.

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20. A radio communication method according to claim 19, including a step where said transmitting part radio communication apparatus refers to an information signal related to said reception preparation completion information received from said receiving part radio communication apparatus, and
15 determines the insertion interval of said known reference signal which is optimal in said data transmission.

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21. A radio communication method used in a radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication
25 apparatus from said transmitting part radio communication

apparatus is variable, including:

a step where said transmitting part radio communication apparatus transmits a data different from said data, to said receiving part radio communication apparatus prior to transmitting said data;

a step where said receiving part radio communication apparatus receives said different data and transmits a reception Ack information indicating that the reception of said different data has been completed;

a step where when said transmitting part radio communication apparatus receives said reception Ack information from said receiving part radio communication apparatus, said transmitting part radio communication apparatus determines the insertion interval of said known reference signal; and

a step where said transmitting part radio communication apparatus transmits said data, into which said known reference signal is inserted in accordance with the insertion interval of determined said known reference signal, to said receiving part radio communication apparatus.

22. The radio communication method according to claim 21, including a step where said transmitting part radio communication apparatus refers to an information signal related to said reception Ack information received from said receiving part radio communication apparatus, and determines the insertion

interval of said known reference signal which is optimal in transmitting said data to said receiving part radio communication apparatus.

5 23. A radio communication method used in a radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through
10 a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication apparatus is variable, including:

 a step where said transmitting part radio communication apparatus receives an information signal transmitted to any
15 radio communication apparatus from said receiving part radio communication apparatus; and

 a step where said transmitting part radio communication apparatus refers to said received information signal and determines the insertion interval of said known reference signal
20 which is optimal in transmitting said data to said receiving part radio communication apparatus.

24. A radio communication method used in a radio communication system that is provided with a transmitting part
25 radio communication apparatus and a receiving part radio

communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication

5 apparatus is variable, including

a step where said receiving part radio communication apparatus determines the insertion interval of said known reference signal; and

a step where said receiving part radio communication
10 apparatus reports the insertion interval of determined said known reference signal, to said transmitting part radio communication apparatus, prior to transmitting said data.

25. A radio communication method used in a radio
15 communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication
20 apparatus from said transmitting part radio communication apparatus is variable, including:

a step where said transmitting part radio communication apparatus transmits an information for requesting the insertion interval of said known reference signal together with a
25 transmission request information of said data, to said receiving

part radio communication apparatus prior to transmitting said data;

a step where said receiving part radio communication apparatus receives the information for requesting the insertion interval of said known reference signal and determines the
5 insertion interval of said known reference signal;

a step where said receiving part radio communication apparatus reports the insertion interval of determined said known reference signal to said transmitting part radio
10 communication apparatus; and

a step where said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with the insertion interval of said known reference signal reported from said receiving part radio communication
15 apparatus, and transmits to said receiving part radio communication apparatus.

26. The radio communication method according to claim 25, including a step where said receiving part radio communication
20 apparatus refers to the information signal related to the information for requesting the insertion interval of said known reference signal and the transmission request information of said data received from said transmitting part radio communication apparatus, and determines the insertion interval
25 of said known reference signal which is optimal in said data

transmission.

27. A radio communication method used in a radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data transmitted through a propagation path to said receiving part radio communication apparatus from said transmitting part radio communication apparatus is variable, including:
- a step where said transmitting part radio communication apparatus transmits a data different from said data, to said receiving part radio communication apparatus prior to transmitting said data;
 - a step where said receiving part radio communication apparatus receives said different data and determines the insertion interval of said known reference signal;
 - a step where said receiving part radio communication apparatus reports the insertion interval of said known reference signal together with a reception Ack information indicating that the reception of said different data has been complete, to said transmitting part radio communication apparatus; and
 - a step where said transmitting part radio communication apparatus transmits said data, into which said known reference signal is inserted in accordance with the insertion interval of

said known reference signal reported from said receiving part radio communication apparatus, to said receiving part radio communication apparatus.

5 28. The radio communication method according to claim 27,
including a step where said receiving part radio communication
apparatus refers to an information signal related to said
different data received from said transmitting part radio
communication apparatus, and determines the insertion interval
10 of said known reference signal which is optimal in transmitting
said data to said receiving part radio communication apparatus.

29. A radio communication method used in a radio
communication system that is provided with a transmitting part
15 radio communication apparatus and a receiving part radio
communication apparatus, in which an insertion interval of a
known reference signal inserted into a data transmitted through
a propagation path to said receiving part radio communication
apparatus from said transmitting part radio communication
20 apparatus is variable, including:

 a step where said receiving part radio communication
apparatus receives an information signal transmitted to any
radio communication apparatus from said transmitting part radio
communication apparatus;

25 a step where said receiving part radio communication

apparatus refers to said received information signal and determines the insertion interval of said known reference signal;

5 a step where said receiving part radio communication apparatus reports the insertion interval of determined said known reference signal to said transmitting part radio communication apparatus; and

10 a step where said transmitting part radio communication apparatus inserts said known reference signal into said data, in accordance with the insertion interval of said known reference signal reported from said receiving part radio communication apparatus, and transmits to said receiving part radio communication apparatus.

15 30. A radio communication method used in a radio communication system that is provided with a transmitting part radio communication apparatus and a receiving part radio communication apparatus, in which an insertion interval of a known reference signal inserted into a data that is propagated
20 in a communication between said transmitting part radio communication apparatus and said receiving part radio communication apparatus is variable, including:

a step where said transmitting part radio communication apparatus and said receiving part radio communication apparatus
25 acquire the insertion interval of said known reference signal;

a step where each of said transmitting part radio communication apparatus and said receiving part radio communication apparatus acquires the insertion interval of said known reference signal; and

5 a step where said transmitting part radio communication apparatus or said receiving part radio communication apparatus uses the insertion interval of said known reference signal acquired by each of said transmitting part radio communication apparatus and said receiving part radio communication apparatus
10 and determines the insertion interval of said known reference signal inserted into said data.

31. A radio communication method used in a radio communication system that is provided with: a plurality of radio
15 communication apparatuses; and a communication managing apparatus communicable with said plurality of radio communication apparatuses, in which an insertion interval of a known reference signal inserted into a data that is propagated in a communication between each of said plurality of radio
20 communication apparatuses and said communication managing apparatus is variable, including:

 a step where said communication managing apparatus determines the insertion interval of said known reference signal which is optimal in the communication with each of said
25 plurality of radio communication apparatuses; and

a step of storing the insertion interval of said known reference signal which is optimal in a propagation path to each of said plurality of radio communication apparatuses.

5 32. A radio communication method used in a radio communication system that is provided with: a plurality of radio communication apparatuses; and a communication managing apparatus communicable with said plurality of radio communication apparatuses, in which an insertion interval of a
10 known reference signal inserted into a data that is propagated in a communication between each of said plurality of radio communication apparatuses and said communication managing apparatus is variable, including:

 a step where each of said plurality of radio
15 communication apparatuses determines the insertion interval of said known reference signal which is optimal in the communication with said communication managing apparatus; and

 a step of storing the insertion interval of said known reference signal which is optimal in a propagation path to said
20 communication managing apparatus.

33. The radio communication method according to claim 32, including a step where each of said plurality of radio communication apparatuses refers to a report signal which is
25 reported to any of said radio communication apparatuses by said

communication managing apparatus, and determines the insertion interval of said known reference signal which becomes optimal in the propagation path to said communication managing apparatus.

- 5 34. The radio communication method, according to one of the preceding claims 18 to 33, including a step of referring to a temporal variation quantity of a propagation path response, in the insertion interval of said known reference signal, and calculating the insertion interval of said known reference
10 signal which becomes optimal in transmitting said data.